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Case studies and testing of the United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009

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Considerations related to the application of UNFC-2009 to uranium resources in Argentina

Note by the secretariat

I. Introduction

1. This report was prepared with the technical input of Mr. Luis López of the National Atomic Energy Commission (CNEA) of Argentina and Mr. Harikrishnan Tulsidas of the International Atomic Energy Agency (IAEA). The report provides considerations related to the application of the United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009 (UNFC-2009) to uranium resources in Argentina.

II. Uranium resources in Argentina and the application of UNFC-2009

2. Historically, uranium resources in Argentina have been classified and reported according to the Organisation of Economic Co-operation and Development (OECD) Nuclear Energy Agency (NEA)/IAEA resource reporting scheme. This system consists of a biaxial classification that considers the degree of geological knowledge and the production costs of uranium concentrate.

3. In 2011, CNEA reported about 20,000 tonnes of uranium (tU) as Identified Resources (Reasonably Assured Resources + Inferred Resources) for the production cost category <130 USD/kgU (NEA/IAEA, 2012[1]). In addition, about 11,000 tU of Canadian National Instrument 43-101 (NI 43-101) certified resources have been reported in recent years by public mining companies (U3O8 Corporation, 2013[2]; UrAmerica Ltd., 2014[3]). The total uranium resources of Argentina are thus more than 31,000 tU in the aforementioned Identified Resources category (see Table 1).

Table 1

Uranium Identified Resources in Argentina according to the NEA/OECD – IAEA Classification Scheme

Deposit	*Type*	*RAR tU ≤ USD 130/kgU*	*IR tU ≤ USD 130/kgU*
Sierra Pintada (CNEA)	**Volcanic-related**	**3,900**	**6,110**
Cerro Solo (CNEA)	Sandstone hosted	4,420	4,810
Don Otto (U3O8 Corporation)	**Sandstone hosted**	**130**	**300**
Laguna Colorada (U3O8 Corporation)	Volcanic-related	100	60
Laguna Salada (U3O8 Corporation)	**Surficial**	**2,430**	**1,460**
Meseta Central (UrAmerica Ltd)	Sandstone hosted	-	7,965
Sub Total		**10,980 tU**	**20,705 tU**
Total		**31,685 tU**	

RAR – Reasonably Assured Resources

IR – Inferred Resources

[1] Nuclear Energy Agency of the Organization for Economic Co-operation and Development (NEA/OECD) and the International Atomic Energy Agency (IAEA), 2012. Uranium 2011: Resources, Production and Demand. OECD. ISBN 978-92-64-17803-8. 487 p. France.

[2] U3O8 Corporation, 2013, http://www.u3o8corp.com

[3] UrAmerica Limited, 2014, http://www.uramerica.co.uk

4. UNFC-2009 allows the documentation and reporting of these uranium resources of the country. UNFC-2009, in addition to providing the project maturity of resources, considers social and economic issues, including regulatory, legal and market conditions imposed by governments and markets, domestic demand, technological and industrial progress and the ever-present uncertainty.

Table 2[4]
Uranium Resources in Argentina (31,685 tU)
UNFC-2009 – NEA/IAEA

Project	*UNFC Class*	*UNFC Sub-class*	*UNFC Categories*	*Resources (tU)*	*NEA/IAEA Production Centre Status*	*NEA/IAEA Classification*	*Resources (tU)*	*Total (tU)*
Cerro Solo	Potentially Commercial Projects	Development Pending	E2 F2.1 G1	2420	Prospective	RAR <$130/Kg	4,420	9,230
			E2 F2.1 G2	2000				
			E2 F2.1 G3	4810		IR <$130/Kg	4,810	
Sierra Pintada	Potentially Commercial Projects	Development on Hold	E2 F2.2 G1	2700	Prospective	RAR <$130/Kg	3,900	10,010
			E2 F2.2 G2	1200				
			E2 F2.2 G3	6110		IR <$130/Kg	6,110	
Laguna Salada	Non Commercial Projects	Development Unclarified		-	Unclarified	RAR <$130/Kg	2,430	3,890
			E3.2 F2.2 G2	2430				
			E3.2 F2.2 G3	1460		IR <$130/Kg	1,460	
Meseta Central	Non Commercial Projects	Development Unclarified	-	-	Unclarified	RAR <$130/Kg	-	7,965
			-	-				
			E3.2 F2.2 G3	7965		IR <$130/Kg	7,965	
Don Otto	Non Commercial Projects	Development Unclarified	E3.2 F2.2 G1	70	Unclarified	RAR <$130/Kg	130	430
			E3.2 F2.2 G2	60				
			E3.2 F2.2 G3	300		IR <$130/Kg	300	
Laguna Colorada	Non Commercial Projects	Development not Viable	E3.3 F2.3 G1	80	Not Viable	RAR <$130/Kg	100	160
			E3.3 F2.3 G2	20				
			E3.3 F2.3 G3	60		IR <$130/Kg	60	

[4] The draft Bridging Document between the OECD NEA/IAEA Uranium Classification and UNFC-2009 (ECE/ENERGY/GE.3/2014/L.1) was referenced in the development of Table 2.

5. For the uranium resources of different projects of CNEA and mining companies, the criteria of UNFC-2009 concerning social and economic viability (E), technical feasibility (F) and geological knowledge (G) were defined at the sub-category level and grouped into major classes considered in this classification system, as shown in Table 2.

6. The identified uranium resources in Argentina are mostly located in the provinces of Chubut and Mendoza. These are areas where no metallic mineral mining projects are in operation. In addition, legislation is in place that markedly restricts uranium production and which needs to be taken into account when studying the social viability of the projects. In Chubut, projects need to wait for the Chubut provincial territory zoning provisions of Law 5001/2003, as well as the introduction of a mining regulatory framework for this jurisdiction. Moreover, the operation of uranium mining and processing in Sierra Pintada will require major changes to the legislation, such as permitting of open pit mining and the use of sulphuric acid, both which are currently forbidden by Law 7722/2007.

7. To define the economic feasibility of CNEA's projects, uranium prices in the international market are taken as a reference, not as a determining factor, considering that the raw material has a bearing of five to seven per cent in the total cost of nuclear energy in the country. Argentina so far has not pursued the objective to obtain dividends from the sale of uranium in international markets. For domestic use, uranium is imported which has implications for security of supply.

8. In recent years, an increase in exploration efforts has led to a significant increase in uranium resources and their level of knowledge, especially in the area of Cerro Solo, where the tonnage and grade estimated is expected to ensure sustained uranium production in the future. The level of uncertainty in the estimation of resources in Sierra Pintada is medium to high, and feasibility has been partially demonstrated by the fact that this deposit was previously in operation for over twenty years. However, new alternatives have been considered for possible future production including the use of "stalls" and alkaline leaching, rather than heap leach and the use of sulphuric acid.

9. In the case of Don Otto, when mapping to the E, F and G axes, this is classified as a "non-commercial project" where development is not clarified. However, it should be highlighted that this deposit was previously in operation and current exploration/evaluation studies yielded very encouraging results, which could make it possible in the future to move the project to a higher UNFC-2009 class.

10. The limited resources of Laguna Colorada make it difficult to envisage extraction at present, unless the characteristics of the ore will allow treatment in a plant that might potentially be located in the future in the area of Cerro Solo.

11. Ultimately, the Cerro Solo project appears to be the most promising project, and with realistic assumptions of possible market conditions and obtaining social licence, there are prospects for extraction in the near future.

III. Conclusion

12. The application of UNFC-2009 as a complement to the NEA/IAEA Classification contributes to both a better understanding of the availability of reliable resources in Argentina and how these resources can contribute to the national nuclear energy programme.